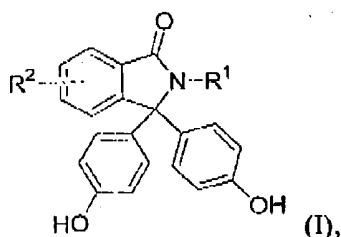


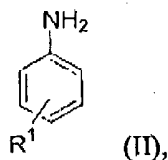
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IN THE SPECIFICATION

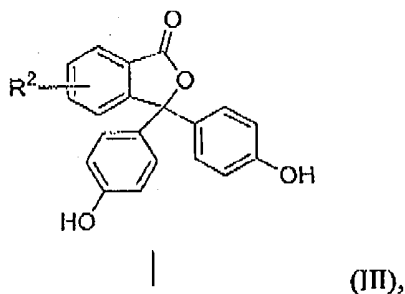
[0017] The present disclosure is generally directed to producing and purifying phenolphthalein derivatives, which are suitable for use as monomers for preparing polymers. An exemplary phenolphthalein derivative, 2-hydrocarbyl-3,3-bis(4-hydroxyaryl)phthalimidines is of formula (I):



wherein R¹ is selected from a group consisting of a hydrogen and a hydrocarbyl group, and R² is selected from the group consisting of a hydrogen, a hydrocarbyl group, and a halogen. For example, a 2-aryl-3,3-bis(4-hydroxyaryl)phthalimidines can be prepared by the reaction of a hydrocarbyl amine, such as, for example, an aromatic amine (also referred to herein as "aryl amine"), e.g., an aniline, of formula (II):



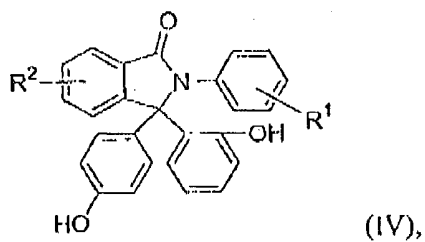
wherein R¹ is as defined above; with a phenolphthalein of formula (III):



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wherein R^2 is as previously defined. An acid catalyst is generally used to facilitate formation of the phthalimidine product. Suitable acid catalysts that can be used include amine salts of mineral acids. Examples of suitable mineral acids include hydrochloric acid, sulfuric acid, and nitric acid. Examples of suitable amines include primary, secondary, and tertiary amines having any combination of aliphatic and aromatic groups bonded to the amine nitrogen. Suitable examples of amine salt catalysts include primary, secondary, and tertiary amine hydrochlorides. Hydrochloride salts of the primary aromatic amines of formula (II) are preferred since the amines of formula (II) also serve as the starting material for preparing the phthalimidines of formula (I). In one embodiment, the catalyst is introduced as a pre-formed salt into the reactor. In another embodiment, the catalyst is generated in the reactor by first charging the amine of formula (II) into the reactor, and then adding about 1/3 to about 1 part by weight of an appropriate mineral acid to phenolphthalein. In still another embodiment, about 0.1 parts to about 0.3 parts by weight of hydrogen chloride gas is introduced into a reactor charged with the aryl amine to form an appropriate amount of the aryl amine hydrochloride catalyst. More hydrochloric acid or more hydrogen chloride gas can also be used, but is generally not required. A solvent can optionally be employed to form the aryl amine hydrochloride. The solvent can then be removed (if necessary), and the aryl amine of formula (II) can be added, followed by addition of phenolphthalein (III). The reaction of phenolphthalein (III) with the aryl amine (II) proceeds by a condensation reaction to form the desired phthalimidine product (I). An excess of the aryl amine over the phenolphthalein may be used to keep the reaction proceeding in the forward direction. Likewise, a higher reaction temperature with or without removal of water by-product also facilitates product formation. However, in order to enhance the selectivity of 2-hydrocarbyl-3,3-bis(4-hydroxyaryl) phthalimidine (I), and suppress the formation of undesired (2-hydroxyaryl)(4-hydroxyaryl)phthalimidine by-product, for example, it is preferred to control the temperature of the reaction mixture, and the rate of removal of water as well. The temperature of the reaction mixture and rate of water removal is controlled such that the crude PPPBP product is at least 97.5 area percent pure 2-hydrocarbyl-3,3-bis(4-hydroxyaryl)phthalimidine in one embodiment, and at least 98 area percent pure in another embodiment. The chemical structure of (2-hydroxyaryl)(4-hydroxyaryl)phthalimidine by-product is shown in formula (IV) below

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wherein R¹ and R² are as previously described.